

USAWC STRATEGY RESEARCH PROJECT

**AEROSPACE POWER IN CITIES:  
JOINT URBAN OPERATIONS FOR THE 21ST CENTURY**

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This SRP is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

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Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>03 MAY 2004</b>		2. REPORT TYPE		3. DATES COVERED -	
4. TITLE AND SUBTITLE <b>Aerospace Power in Cities Joint Urban Operations for the 21st Century</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) <b>Michael Marra</b>				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>U.S. Army War College, Carlisle Barracks, Carlisle, PA, 17013-5050</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT <b>See attached file.</b>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES <b>30</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			



## ABSTRACT

AUTHOR: Michael A. Marra  
TITLE: AEROSPACE POWER IN CITIES: JOINT URBAN OPERATIONS FOR THE 21<sup>st</sup> CENTURY  
FORMAT: Strategy Research Project  
DATE: 19 March 2004      PAGES: 30      CLASSIFICATION: Unclassified

As the U.S. Military continues to dominate the air, land and sea, adversaries will attempt to exploit perceived vulnerabilities. The new American way of war attempts to defeat the enemy without necessarily destroying his infrastructure or killing or injuring his non-combatants. Realizing this, future enemies of the U.S. and allied/coalition forces will try to lure us into combat in urban areas, where the complexities of applying decisive force are more pronounced and the ability to use overwhelming force is constrained by the threat of collateral damage. As the world becomes more urbanized, the likelihood of conducting humanitarian, peacekeeping and combat operations in cities will increase. While urban operations have traditionally been land centric, the joint applications of aerospace power must be part of our grand military strategy. This strategic research paper explores the strategy for projecting aerospace power from all services over urban terrain while acknowledging the diplomatic, informational, economic, and military considerations and constraints of future conflict. It will focus on the key elements of aerospace strategy in urban areas to include a concept that will encompass five major components. These components should be regarded as interdependent, continuous and overlapping. They include evaluation and interpretation, identification of centers of gravity, a specific application of force, a sustainment of the operation, and finally, termination and transition to post-conflict operations. This analysis also offers some recent and relevant case-studies to illustrate effective or ineffective uses of aerospace power in urban terrain, thereby providing strategic leaders lessons that may be applied in the 21st Century.



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## AEROSPACE POWER IN CITIES: JOINT URBAN OPERATIONS FOR THE 21<sup>ST</sup> CENTURY

The future of warfare lies in the streets, sewers, high-rise buildings, industrial parks, and the sprawl of houses, shacks, and shelters forming the broken cities of our world. We will fight elsewhere, but not so often, rarely as reluctantly, and never so brutally. Our recent military history is punctuated with city names -- Tuzla, Mogadishu, Beirut, Panama City, Hue, Kuwait City, Freetown -- but these encounters have been but a prologue, with the real drama still to come.

—Ralph Peters, 1996<sup>1</sup>

Throughout history, military strategists have studied the terrain on which they were likely to fight. From those examinations, leaders determined the necessary tactics, personnel and equipment to succeed in those environments. The most successful leaders adapted their strategies to the terrain to exploit the strengths of their forces as well as to deny the enemy's strength and attack his weaknesses.

Military strategists of the 21<sup>st</sup> century acknowledge conflicts will more likely occur on urban terrain. As the United States and its allies achieve supremacy on battlefields, adversaries are weaving the urban landscape of cities into their own strategies to offset the effects of our major weapons systems, all of which are primarily designed to operate in open, sparsely populated or minimally constructed areas.

This essay examines the aerospace military element of national power in urban operations. It offers air-minded ideas and concepts for urban operations which should be considered before specific types of personnel and equipment are committed to battle to support a Joint Forces Commander (JFC). It examines the nature of cities and shows why the urban battlespace is so appealing to our current and future adversaries. It explores the role of aerospace power in cities and the probable types of missions the strategist should consider, while addressing the constraints he must comprehend in formulating plans. It specifies five key components of aerospace strategy in urban areas and demonstrates their relevance by reviewing modern aerospace operations over the last 25 years. In its conclusion, it offers observations and lessons learned for future aerospace strategists.

A review of recent warfare confirms "no modern force has achieved strategic-level victory through an offensive campaign waged in an urban environment."<sup>2</sup> The attacks of 9-11 and the recent enemy actions in Afghanistan and Iraq demonstrate the enemy will "employ a method that exploits the social dimensions of strategy to offset the disadvantages in the technical dimension."<sup>3</sup> In a paper published in Army Magazine, author Robert Leonard states "...beyond



the physical challenges urban areas pose for conventional forces, urban warfare entails social and cultural issues that makes it the enemy's fight of choice - and we are not fully prepared."<sup>4</sup>

## THE NATURE OF CITIES

If you don't understand the cultures you are involved in; who makes the decisions in these societies; how their infrastructure is designed; the uniqueness in their values and in their taboos - you aren't going to be successful.

—George Wilson<sup>5</sup>

## THE CHARACTERISTICS AND TYPES OF URBAN AREAS

Urban areas present the most complex physical terrain that exists.<sup>6</sup> They consist of manmade structures of varying types, sizes, materials, and construction.<sup>7</sup> Urban areas vary widely, ranging in population from over 100,000 to 20,000,000. These urban areas are sometimes laid out very systematically, and sometimes in a totally chaotic, random fashion. Cities may be modern or layered outgrowths from an ancient core. They may have towering buildings or none greater than three stories high. But, all cities share three characteristics, an urban triad, that is generally so intertwined as to be virtually inseparable.<sup>8</sup>

First, cities exhibit a complex manmade physical terrain that has been superimposed on existing natural terrain.<sup>9</sup> Second, a population of significant size and density inhabits, works in, and uses the manmade terrain.<sup>10</sup> Finally, the infrastructure upon which the area depends may also occupy manmade terrain; it provides human services and cultural and political structure for the urban area and often beyond, perhaps for the entire nation.<sup>11</sup> These characteristics interact to make each urban area a complex and dynamic "system of systems" - each with its unique physical, political, economic, social, and cultural identity.<sup>12</sup>

## CULTURES

Ethnic and cultural compositions within urban areas certainly matter during armed conflict. Beyond the physical architecture of a city are three broad types of "human terrain." For military purposes, cities can be classed as hierarchical, multicultural, or tribal.<sup>13</sup>

Hierarchical urban areas are found in all U.S. cities. They operate under chains-of-command within a broadly accepted rule of law, and follow established rules of human interaction.<sup>14</sup> These hierarchical urban areas have provided people with a high degree of well-being. Such cities, with their united citizens, can provide bitter, prolonged resistance to an attacker (Tyre, Stalingrad, Berlin). Paradoxically, once occupied, they can be the easiest to govern if the population recognizes benefits lie in collaboration.<sup>15</sup>

Multicultural urban areas possess contending systems of customs and beliefs, often aggravated by ethnic divisions and struggles for dominance.<sup>16</sup> Groups that do not identify with those in power must be coerced into desired behaviors. Multicultural cities typically squander their energies and human capital on social struggles; such environments are typically destructive (Jerusalem, Baghdad). From a military standpoint, multicultural urban areas are generally very easy to conquer, but difficult to administer after the peace has been established.<sup>17</sup>

Tribal urban areas are characterized by differences in blood, but not in race, or necessarily religion or ethnicity. Conflicts in this type environment can be the most intractable and merciless. As traditional rural societies grow overpopulated and impoverished, the lure of the city disproportionately draws young males - society's most volatile demographic slice - seeking opportunity, adventure, and reinvigorated identity.<sup>18</sup> (Mogadishu, Kigali, Freetown) From a military standpoint, tribal urban areas are especially difficult areas for peacekeeping.

#### THE TRENDS OF POPULATION GROWTH AND MOVEMENT

Migration into urban areas has increased significantly. This information was compiled variously from the United Nations, the Carnegie Commission on Preventing Deadly Conflict, and the United States Marine Corps Intelligence Activity.<sup>19</sup>

- Over the past 40 years, urban dwellers have more than tripled, from 737 million to 2.5 billion.<sup>20</sup>
- By 2005, the majority of the world's population will live in urban areas.<sup>21</sup>
- Over 160,000 people per day migrate to developing cities.<sup>22</sup>
- By 2005, 21 of the world's largest cities and 264 of its 414 "million person" cities will be in the developing world.<sup>23</sup>
- The United Nations predicts by 2050, the third-world population will rise 80 percent.<sup>24</sup>

While developed nations are able to plan for increases in population and build infrastructure necessary to support large concentrations, the majority of the nations in the developing world are incapable of similar accommodation and are being overrun by humanity. Thus, the developing world is more prone to conflict since their lack of resources causes violent competition.

#### THE TREND TO FIGHTING IN CITIES

Military operations in urban areas are inevitable. Over the past 25 years, since 1989, some element of U.S. military or law enforcement landpower and airpower has been employed in - Panama, 1989; Liberia, 1991; Manila, 1990; Kuwait City, 1991; Mogadishu, 1991-94; Haiti,

1994-95; Los Angeles, 1992; Bujumbura, 1994; Kobe, 1995; Monrovia, 1996; Tuzla, 1996; Zagreb, 1996; Tirana, 1997; Kinshasa, 1997; Freetown, 1997; Mombassa, 1998; Pristina, 1999; Kandahar, 2001; Baghdad, 2003...and more. There is no practical way to avoid urban areas in 21<sup>st</sup> century warfare. From peacemaking to humanitarian operations to combat operations, urban areas and their inhabitants are going to be a major factor in our strategy formulations.

## **THE URBAN BATTLESPACE**

They are...the post-modern equivalent of jungles and mountains - citadels of the dispossessed and irreconcilable. A military unprepared for urban operations across a broad spectrum is unprepared for tomorrow.

—Ralph Peters<sup>25</sup>

## **WHY PEOPLE FIGHT IN CITIES**

During Operation Iraqi Freedom, a fortunate series of events took place: The ferocious urban battle of Baghdad and of other Iraqi cities never materialized as Coalition planners had predicted. Through ineptitude and lack of coordination, the Iraqi military did not take full advantage of their own urban terrain to engage Coalition forces<sup>26</sup>. While there was some urban combat, and some close air support was used, it was nowhere near the level expected. This was a great relief to Army and Marine forces leading the assault on the capitol city. Had organized and skilled Iraqi forces consolidated within Baghdad, we can only imagine how difficult it would have been to dislodge them.

Why did we so readily expect to fight in the city? Combat in urban areas is ideally suited for America's enemies. Urban warfare can be inexpensive and low-tech, making it particularly appealing to regimes like the unconventional forces we are now fighting in post-war Baghdad.<sup>27</sup> Offensive action relies on speed and synchronization, which is lost in such restrictive terrain. Most of the U.S.'s technological advantages can be largely diminished by skilled and determined adversaries in urban terrain.<sup>28</sup> Urban terrain favors the defender and denies most U.S. military advantages: line of sight is extremely limited for target acquisition, mutually-supporting fires, and communications; operational depth needed for synchronization is virtually absent; and inevitable collateral damage impedes the attacker while effectively enhancing the defender's cover, concealment, and relative mobility.<sup>29</sup> Our enemies have observed the U.S. military pulling out of cities like Beirut, and witnessed the limits of power the U.S. would apply in Panama City and Sarajevo. They have learned that a casualty intensive battle against the U.S.

is the only chance they have. They know they can't win, but they can make us lose by simply outlasting us and declaring victory as we withdraw.

#### THE AMERICAN WAY OF WAR AND URBAN COMBAT

Every country has a unique style of warfighting. The "American Way of War" has been described as a strategy of "annihilation" relying on the industrial base and technology. This type of war is essential to the concept of "overwhelming force" prescribed by the Powell Doctrine. However, this type war – with its reliance on mass, maneuver, and supremacy of firepower - is much more suited for anything but urban terrain.

#### COLLATERAL DAMAGE AND NON-COMBATANT CASUALTIES

Since WW II, military operations in urban areas have run the full spectrum from unconventional insurgencies to atomic war. There have been enormous numbers of non-combatant casualties and staggering destruction of infrastructure. The nature of warfare in urban areas has left warfighters few options, and we have seen modern cities such as Stalingrad, Dresden, Tokyo, Hiroshima, Sarajevo, and Grozny all suffer horrific devastation. Some of these never fully recovered from the fighting within; much of the damage has resulted from the effects of aerospace power via aerial bombing. Before precision munitions were available, strategic planners resorted to "annihilation" by area bombing. In Bombs, Cities and Civilians by Dr. Conrad C. Crane, he documents that even after the U.S. and others developed more precise ways to deliver ordnance through the use of bombsights and radar, vast areas of cities were nonetheless destroyed, such as Mannheim in Germany and Tokyo in Japan.<sup>30</sup> As Crane asserts, U.S. airmen did their best to avoid non-combatant casualties, yet thousands were killed in Germany and Japan, and, to some extent, even in "friendly" countries like France, Belgium, and Holland.

#### THE MEDIA EFFECT IN URBAN AREAS

The media will play an enormous role in any urban warfighting. With the advent of "embedded media" and digital photography, it is now commonplace for the "man on the street" to influence strategy by simply taking digital photos and posting them on a web site or selling them to a news producer. This type of technology is ubiquitous, even in less developed nations. We must anticipate images of destructive airpower will be broadcast continually and that they will have some effect on domestic and world opinion. For example, we know within 48 hours of the videos of Americans being dragged through the streets of Mogadishu in 1993, the President decided to withdraw from Somalia<sup>31</sup>. Aerospace strategists must wage their own

information operations campaign to counter the fact and fiction being generated from within cities.

#### THE COMPLEXITIES OF APPLYING DECISIVE FORCE IN URBAN AREAS

The aerospace strategist must focus on the enemy, but also has the added concern of protecting noncombatants and minimizing damage to the infrastructure upon which they depend for survival. We must not allow the enemy to achieve an asymmetric advantage by choosing to fight in a city and stripping us of our firepower and mobility advantage.

#### **THE MOST PROBABLE TYPES OF MILITARY AEROSPACE APPLICATIONS IN URBAN AREAS**

“The conventional army loses if it does not win. The guerilla wins if he does not lose.”

—Henry Kissinger<sup>32</sup>

Aerospace participation in urban areas will cover a wide spectrum of missions - strikes or raids by special operations forces, peace enforcement or peacekeeping, counterterrorism, noncombatant evacuation, relief operations, support to civil authorities, or others. In all missions, planners must understand and shape the battlespace, engage the adversary or solve the problem, then consolidate and transition to civil authority.<sup>33</sup> The missions most likely to be influenced by aerospace power are humanitarian operations, peacemaking and peacekeeping operations, and combat.

#### HUMANITARIAN AND CIVIL ASSISTANCE OPERATIONS

Disasters, both natural and man-made, occur frequently in urban areas. The United States, operating alone or within a coalition, will be called to respond to such disasters. Man-made disasters are often exacerbated by nature. Somalia is an example of such a case. The capitol city of Mogadishu became the focal point for humanitarian operations. Operation Continue Hope and UNISOM II started as humanitarian operations but evolved into peacemaking and combat operations, all of which involved joint airpower for airlift, reconnaissance, surveillance, and direct action.

#### PEACEMAKING/PEACEKEEPING OPERATIONS

US forces conducting peacemaking and peacekeeping operations, employing air, land and sea forces, are becoming commonplace. Peacemaking/peacekeeping operations occur before or after combat operations. In the case of Somalia, peacekeeping preceded combat, but

in Sarajevo and Baghdad, it took place afterward. Peacekeeping is probably the most difficult mission for the military strategist because it is so difficult to define, execute, and evaluate. Operations like UNISOM II in Somalia, Restore Democracy in Haiti, and Shining Hope in Albania, provide examples of employing aerospace power for peacekeeping.

## COMBAT OPERATIONS

The most difficult and costly military operations are those which involve combat action on urban terrain. Historically, both attacker and defender in urban terrain suffer enormous casualties and incur substantial damage. Additionally, the toll of human suffering of non-combatants can be staggering. In this setting, aerospace assets can destroy or disrupt enemy forces and infrastructure on which they depend.<sup>34</sup> Direct combat actions involving aerospace power in urban areas have included a wide range of airpower options, as we have witnessed during Arab-Israeli conflicts, as well as the battles for Grozny, Chechnya and others. Those options include everything from pin-point strikes on suspected terrorist buildings by the Israeli Air Force to area bombing by the Russians. While aerospace strategist would rather avoid these areas, this simply won't be an option. The ancient warrior/strategist Sun Tzu warned long ago ... "the worst policy is to attack cities. Attack cities only when there is no alternative."<sup>35</sup> As cities continue to dominate the landscape of the world, we don't have alternatives.

In 1999, former Marine Commandant General Victor H. Krulak described the environment for these missions well when he called it the "Three Block War": engaged in humanitarian assistance at sunrise, peacekeeping at noon, and conventional combat at sundown.<sup>36</sup> At present, the Marine Corps doctrine reflects accomplishing all these tasks simultaneously.

## THE NATIONAL ELEMENTS OF POWER - CONSIDERATIONS OF AEROSPACE STRATEGISTS

What the enemy fears most is the war of cities and streets, that the enemy expects tremendous, grave losses in. So we also stress the importance of suicide operations against the enemy, those operations that cause so much harm to the enemy in the U.S. and Israel and they have never seen anything like them in their history, thanks be to Allah.

—Osama Bin Laden<sup>37</sup>

## DIPLOMATIC/LEGAL

The aerospace strategist must realize there will be increasing limits on what force can be applied due to operational, diplomatic and legal constraints – commonly described as the "rules

of engagement” or ROE. Factors influencing the establishment of ROE by commanders are the law of armed conflict, domestic laws, political factors, cultural factors of both our nation and the nation we are trying to influence, and proportionality of force employed. The strategist has to ensure the ROE is consistent with the political objective of the operation so he does not escalate or derive an undesired reaction from the enemy, or appear brutal or immoral.

#### INFORMATIONAL

The international media is ubiquitous during urban campaigns. Future wars in cities will be fought on camera and the informational power this wields cannot be understated. Public opinion can quickly shift based on one incident, so a full-scale information-operations campaign must be mounted simultaneously with a military campaign. For instance, implementing a humanitarian assistance operation, releasing timely public policy statements, and hosting public affairs messages and dialog with news media explaining our overall objectives would be advantageous during our campaign. We must never forget there is a moral dimension to using aerospace power in urban areas. We need to maintain the moral high ground of this dimension. We need to be especially sensitive to incidents or collateral damage, and respond quickly with explanations and investigations stipulating the facts of each case.

#### ECONOMIC

Waging a conflict on urban terrain has historically led to significant amounts of destruction of infrastructure and private property. Today, with smaller, more accurate weapons, aerospace strategists can now pin-point targets better, avoiding needless damage. Even with very accurate targeting, there will still be restraints on targets due to their economic value in the post-conflict stage. Strategists must incapacitate but not destroy infrastructure so we can plan to use it to stabilize and transition the area into peace afterward.

#### MILITARY

Employing military aerospace power in urban terrain must be governed by a sense of proportionality, which will define and restrict the weapons systems the strategist can employ. While carpet bombing may be a possibility, it is no longer a probability due to the consequences cited earlier. Therefore, military weapons, such as bombs, missiles, rockets, or cannons will have to be more compact, more precise and more controlled. We should continue to invest in the development and production of precision weapons.

## THE KEY COMPONENTS OF AEROSPACE STRATEGY IN URBAN AREAS

“To ensure the U.S. military has the ability to effectively operate on the urban battlefield, the CINC’s and Services must expand their present efforts of study of the urban environment and must develop an integrated approach that optimizes key warfighting capabilities for future operations on urban terrain.” Defense Planning Guidance:

—FY 2000-2005<sup>38</sup>

As constraints continue to limit what force aerospace strategists can apply in urban terrain, a coherent set of guidelines must be established to provide a vector to our operational and tactical planners. From the study of history and warfighting strategic theory, we can develop some key components of aerospace strategy in urban areas. We know some of the rationale for these components from understanding the organizational structure of our military and how we apply aerospace assets. The historic American tendency in war is to maximize desired outcomes and minimize risk, especially if the operation is not fully supported politically or there is no clear threat to our own national security. To overcome the advantages urban areas offer to our adversaries, the JFC must exploit the unique capabilities from all the services, and possibly from alliance and coalition forces, along with contributions of other government agencies. During an Urban Operations Conference in April, 1999, USAF Major General Norton A. Schwartz delivered a compelling address on aerospace power in urban environments. His remarks anticipated key concepts set forth in Joint Publication 3-06, Doctrine for Joint Urban Operations. Using theoretical and practical considerations, we can surmise a set of key components of aerospace strategy in urban areas that may be used in the 21st century. The following five components will be critical to success in a future urban conflict. In using the components to develop a campaign plan, the strategist should understand they should not be viewed as linear or sequential stages, but be regarded as “interdependent, continuous, and frequently overlapping processes comprising of a fluid, joint campaign plan for urban operations,” as Major General Schwartz stated.<sup>39</sup>

### EVALUATION AND INTERPRETATION

The first and most important component of this urban aerospace strategy is the “evaluation and interpretation component” because it encompasses the intelligence preparation of the urban battlespace - a strategic consideration of the type of city and culture. This effort to seek valid information and determine fidelity must be applied continuously to determine the implications for military aerospace operations, otherwise known as “battlespace analysis.” This



analysis allows the JFC to capitalize on information superiority to thoroughly identify the adversary's key nodes, systems, dependencies and choke points central to his ability to apply force, maneuver, and communicate across the urban battlespace. Conclusions should be based on a mutually supportive combination of human, electronic and historical data all tied together in the "net-centric" concept linking our air and ground forces. This will provide us with time-sensitive targeting information and link the DoD in with other government agencies so all are synchronized into unity of effort.

#### IDENTIFICATION OF THE CENTERS OF GRAVITY

After evaluating data and converting it into information, the strategists can now perform another critical task - determining the centers of gravity in the urban area. In The Air Campaign - Planning for Combat, John A. Warden III, a retired USAF Colonel and strategist, focuses on the use of airpower at the operational level in a theater of war. He states the most compelling task for the theater commander is translating national war objectives into strategic, operational, and tactical plans that can actually be accomplished<sup>40</sup>. Imperative to useful planning, Warden asserts, is the identification of the enemy centers of gravity, for at such critical points application of force will have the best chance of being decisive. Clausewitz, the originator of this term, only believed in one center of gravity and called it the "hub of all power and movement."<sup>41</sup> Warden differs by describing several centers of gravity, but the principle has similarities. Warden's five-ring model views the enemy as a hierarchical system composed of five subsystems. They consist of leadership, organic essentials, infrastructure, population, and fighting mechanisms. First, there is the "leadership" subsystem, which in a city would be the government. Next, there is the "organic essentials" subsystem, which in a city is energy - oil or electricity. Next are the infrastructure subsystems, which in a city are roads, airfields and factories. The next subsystem is population, which in a city are the inhabitants. While we are now refraining from targeting populations, they are still subject to psychological campaigns from aerospace assets, to include the EC-130E which can control radio and television airways to broadcast compelling messages to urban populations. Finally, we have the fighting mechanism subsystem, which is generally described as the fielded armies, other military, or police. In a city, this could be hostile military or government police or agencies. Identifying and targeting these centers of gravity and subsystems enable aerospace strategists to apply force effectively and proportionally to accomplish desired effects.

## SPECIFIC APPLICATION OF A FORCE

Once one has identified the enemy's "hub," he can then apply the right type pressure to influence the enemy. We refer to this as decisive engagement, by means of which we attain the advantage by applying strengths against the key enemy nodes, systems or choke points or other vital areas identified during the evaluation and interpretation component. The end-state of this application is to weaken or destroy an adversary's cohesion, organization, command and control, lines of communication and psychological balance so as to ultimately shape, modify, or control enemy behavior in accordance with the JFC's plan. In combat operations, successful engagement requires "full spectrum dominance of the battlespace through the seizure, disruption, control, or destruction of the adversary's critical factors, to include operational and strategic centers of gravity"<sup>42</sup>. This can include precision air strikes, insertion of SOF or conventional forces, show-of-force, or numerous other applications. An example of this power that influenced a major "battle" for a city was the Berlin Airlift from 1947-49. Without firing a shot, transport aircraft waged a battle for "urban terrain" by flying in supplies for months in all types of weather, day and night, to defeat the Communist blockade of the beleaguered city.

## CULMINATION OR SUSTAINMENT

After a decisive engagement, the aerospace strategist must consider culminating, consolidating, and sustaining the progress attained. This means continuing to analyze progress or problems to fully comprehend the battlespace. It also means the strategist has to protect what has been gained, while retaining the initiative to disorganize the enemy and continue to seek out centers of gravity to disrupt. In an urban war, this could mean providing logistical support by air to ground forces after a key node had been destroyed and now needs to be occupied. It could also mean providing helicopter close air support around objectives deemed sufficiently permissible for low and slow flying aircraft.

## TERMINATION AND TRANSITION

After the aerospace strategist has achieved his strategic and operational objectives in the urban area, he must then move to termination of the combat operation and transition to the next phase, most likely peace-shaping operations that signal the end of widespread organized armed conflict. In the urban area, this may include introducing international peacekeepers or humanitarian organizations, setting conditions for regime change, destroying weapons stockpiles, disarming factions, and similar activities. This could also mean aerial food distribution, medical evacuation, and movement of international observers and re-supply operations, similar to what is occurring in major cities in the Balkans at this time.

## **CASE STUDIES OF EFFECTIVE AND INEFFECTIVE AEROSPACE OPERATIONS IN URBAN AREAS**

“Nothing can ever make urban warfare easy.”

—Dr. Russel Glenn<sup>43</sup>

We have numerous modern examples of the application of aerospace power in urban terrain. For the purpose of illustrating the concepts outlined earlier, only the more recent conflicts starting with Operation Just Cause in Panama in 1989 to Operation Iraqi Freedom in 2003 will be examined. We will not re-evaluate the operations in their entirety, but will focus on how joint aerospace power was used and which concepts were applied well or poorly.

### **OPERATION JUST CAUSE IN PANAMA CITY, PANAMA, 1989**

Airpower opened the assault to oust General Noriega and his military forces keeping him in power. This campaign involved extensive urban combat; all but two of the targets for airpower were in urban terrain. With special operations forces in the lead, parallel joint air operations were applied with effective results, using all the major components in aerospace strategy in urban terrain - but especially in identifying the centers of gravity and destroying them from the air. Aerospace power neutralized enemy forces in their own urban sanctuary and interdicted key reinforcing units at numerous chokepoints throughout the battle making the mission for ground forces less difficult<sup>44</sup>. While there were civilian casualties and collateral damage to buildings, the speed with which the operation took place kept them to a minimum. The proper strategic use of aerospace power was decisive in winning the urban campaign in Panama.

### **OPERATION RESTORE HOPE IN MOGADISHU, SOMALIA, 1992-3**

The mission in Somalia was the most airpower intensive since Gulf War, and the fight in the urban terrain of Mogadishu had a very large airpower piece to it. As Operation Restore Hope evolved into Operation UNISOM II, aerospace power changed from airlifters carrying food to fixed and rotary wing gunships engaging warlords. During the ill-fated 3 Oct 1993 battle, airpower was not fully integrated into the planning process and the results were tragic. Ground forces battled their way out of a hornet's nest in street-to-street fighting without proper close air support. Strategic planners did not apply the proper level of evaluation and interpretation, nor did they implement a specific application of force. This “pyrrhic victory” on the streets of

Mogadishu resulted in strategic failure, but has provided strategists a good example to learn from.<sup>45</sup>

#### OPERATION RESTORE DEMOCRACY IN PORT-AU-PRINCE, HAITI, 1994

The mission to remove the Cedras Regime and to return a democracy offers a superb example of how the threat of overwhelming airpower compelled the enemy to capitulate without firing a shot. This battle was planned to occur in Port-au-Prince, but psychological operations and persuasion by shrewd negotiators backed by joint aerospace power was sufficient to convince the Cedras Regime to acquiesce peacefully. Former President Jimmy Carter and Chairman of the Joint Chiefs of Staff Colin Powell met with Cedras and informed him strike and airdrop aircraft were on the way to insert forces. After Cedras capitulated, aerospace forces provided robust overhead command and control, tactical lift, and protective over watch for the international force, demonstrating the culmination component and the termination and transition component of strategy in urban terrain. In this case, the diplomatic and military elements of national power were so well integrated the enemy was coerced to surrender<sup>46</sup>.

#### RUSSIAN INCURSION INTO GROZNY, CHECHNYA, 1994-5

The Russians failed to enact the first two strategic components. They failed to effectively evaluate and interpret the enemy and they never identified the centers of gravity. Instead, they applied overwhelming force indiscriminately throughout the city, using poor command and control and little unity of command against an enemy using the city to its utmost advantage. The Russians would destroy large areas of the city without achieving any of their objectives. This resulted in turning more of the population against them. They employed no coherent aerospace strategy, only an uncoordinated ground strategy using airpower sporadically to destroy urban terrain - creating more places for guerillas to hide<sup>47</sup>. This campaign represents a failure of aerospace strategy. This is surprising for the Russians had ample opportunity to learn from the urban battles of Stalingrad and Leningrad in WW II. The Russians eventually were successful in this battle, but time has shown their strategy, operations and tactics have worked against their long-term ends of creating stability in Chechnya.

#### OPERATION ALLIED FORCE, BELGRADE, SERBIA, 1999

This campaign was the first time aerospace power was primarily employed to win a war, rather than supporting a ground component. The plan was to launch coercive strikes on Serbia until the leadership in Belgrade accepted NATO's terms to end what was viewed as a war for "ethnic cleansing" of Albanians in southern Kosovo<sup>48</sup>. Aerospace strategists developed a plan

laced with complex political restrictions calling for a graduated bombardment, similar to “Rolling Thunder” campaign in Vietnam. Theoretically, airpower was used as a political tool to communicate intentions to Milosevic. Many of the targets were in the city of Belgrade - a modern city where miscalculation could lead to strategic disaster, as it did after U.S. bombs hit the Chinese Embassy mistakenly identified as a military target. Allied strategists led by U.S. planners did apply all the necessary components and did achieve their objectives, but things did not go as planned. Initially, Serbia demonstrated its ability to withstand bombings. NATO intensified the attacks and expanded target lists to “sustainment” targets. Bombing planned to last days stretched into three months. But NATO was able to show unity and resolve and never relented. While the evaluation and interpretation component miscalculated the length of mission, they did identify the center of gravity, the Milosevic Regime, and targeted it as best they could despite numerous political and operational restrictions<sup>49</sup>. The specific application of force was appropriate; the campaign didn’t cause unacceptable levels of non-combatant casualties or collateral damage - roughly 500 civilians were reported killed in 78 days of bombing (23,000 bombs) and 38,000 sorties<sup>50</sup>. Aerospace strategists succeeded and achieved their objectives through shrewd application of force coupled with tough diplomacy.

#### OPERATION IRAQI FREEDOM, BAGHDAD, IRAQ, 2003

This exhibits a classic blend of all the components in the urban battlespace of Baghdad - from the “Shock and Awe” start, to the joint close air support provided the Army and Marines, to the constant reconnaissance, to the rescue of a soldier in urban Nasiriyah. The joint team integrated all the strategic aerospace components into an evolving “net-centric” battlespace that overwhelmed the Iraqis. The use of aerospace power to react to time-sensitive leadership targets in the city, to react to enemy armor and troop movements, and to provide our ground forces with the security of knowing they enjoyed complete supremacy from the air provided the momentum for liberating Baghdad in only 21 days<sup>51</sup>. This was truly the first campaign where aerospace power was integrated so well that observers viewed the speed, precision and lethality as “operations normal.” In short, aerospace strategists employed all the key components of aerospace strategy in an urban area and continue to do so today.

#### OBSERVATIONS AND LESSONS LEARNED

We prefer not to fight the city. We prefer not to have to destroy what is part of Iraq's future to get rid of its past.

—General Peter Pace<sup>52</sup>

The aerospace strategist must understand the importance of linking urban operational and tactical objectives to strategic goals and balancing them against the risks involved. This assessment is increasingly important as the strategic, operational and tactical realms are compressed by the urban battlespace. The “strategic corporal or airman” has now arrived: Our warfighters in and above the city streets now have the capability to assert major influences on the outcomes by their level of situational, political, and even cultural awareness of the city in which they are fighting. The aerospace strategist may require the synchronization and integration of not only military forces, but of civil and other governmental agencies to enable the components to work in parallel.

The human dimension of the urban environment is vital to understand and will affect the conduct of urban operations - in the air and on the land. Aerospace strategists must start with the right staff personnel in the positions to plan the campaign, then their ideas, and finally, the appropriate equipment and technology to win. While we should embrace such wonderful innovations as precision munitions, sensors, non-lethal weapons and time-sensitive targeting technology, they are only effective if used on the right targets. Success will be based on valid strategy. Knowledge will be the key to winning in the urban areas. Strategists must understand and integrate all the elements of national power by using the strengths of the interagency processes.

Aerospace strategists must understand the ever-increasing requirements to prevent urban non-combatant casualties and collateral damage to urban infrastructure. Such considerations place significant restraints on the application of aerospace power.<sup>53</sup> Similar constraints on aerospace power will continue to increase as diplomatic, legal, informational, and economic considerations play larger roles in future conflicts. The images of non-combatant casualties and collateral damage have powerful and sometimes almost instantaneous effects on overall perceptions; they can influence overall strategy.

Aerospace strategists must understand the key components of aerospace strategy in urban areas, to include evaluation and interpretation of the environment, identification of the centers of gravity, the specific application of force, culmination or sustainment of the operation, and finally, termination and transition to peace operations. These components are essential to conducting a coherent campaign and should be regarded as interdependent, continuous, and overlapping, in order to sustain a fluid but robust campaign in the urban environment.

## **SUMMARY**

All the demographics point toward massive growth in urban areas. In most cases, growth is taking place in the volatile developing world. The cultural aspects of these emerging urban areas will lead to clashes due to friction over resources, religion, race, and ethnicity. Potential adversaries will choose to fight in these urban areas since this environment provides them some element of concealment and support. Further, they can leverage their strengths against the weaknesses of modern, technology-dependent militaries, such as the U.S. military. As crises emerge in the world and the U.S. responds, we can expect to fight a “three block war” in cities where strategists expect operators to perform humanitarian, peacekeeping and combat operations simultaneously. In such situations the actions of our junior operators will have strategic consequences as the compression of the strategic, operational, and tactical arts merge in the complexity of the urban battlespace. We know the constraints on our operators will increase as political, legal, informational, and economic interests compete with military necessities, thereby increasing risk. However, we can plan and operate within a framework of key components of aerospace strategy in urban areas and have learned how these components were applied during campaigns over the last 25 years. We know possessing the technological or numerical edge does not always guarantee strategic victory. With effective strategy and the right leaders, we can employ aerospace forces in the urban battlespace correctly.

WORD COUNT= 6,082

## ENDNOTES

<sup>1</sup> Peters, Ralph, "Our Soldiers, Their Cities," *Parameters*, Spring, 1996, 43.

<sup>2</sup> Steven Alexander, "Urban Warfare: US Forces in Future Conflicts," *Military Review*, Jan-Feb 2002, 83.

<sup>3</sup> Liotta, P.H., Chaos as Strategy, *Parameters*, Summer 2002, 48.

<sup>4</sup> Paraphrased from Robert Leonard's provocative thesis and statement that "Urban Warfare is the fight of the future- the very near future - and we are not ready" cited in "Urban Warfare in the Information Age," *Army*, Apr 2003, 39.

<sup>5</sup> Wilson, George, Quotes on Urban Warfare, <<http://www.urbanoperations.com/>>, accessed 29 Oct 2003.

<sup>6</sup> Joint Publication 3-06, *Doctrine for Joint Urban Operations*, 1-2

<sup>7</sup> Ibid., 1-2.

<sup>8</sup> Ibid., 1-2.

<sup>9</sup> Ibid., 1-2.

<sup>10</sup> Ibid., 1-2.

<sup>11</sup> Ibid., 1-2.

<sup>12</sup> Ibid., 1-2.

<sup>13</sup> Peters, Ralph, The Human Terrain of Urban Operations, *The Eurasian Politician*, Issue 3, October 2000, 8-16, and also from *Parameters*, Spring, 2000, 4-12.

<sup>14</sup> Ibid., 4-12

<sup>15</sup> Ibid., 4-12

<sup>16</sup> Ibid., 4-12

<sup>17</sup> Ibid., 4-12

<sup>18</sup> Ibid., 4-12

<sup>19</sup> Dake, Terrance R, General, USMC, Speech, The City's Many Faces: Investigating the Multifold Challenges of Urban Operations, April, 1999, 200.

<sup>20</sup> Ibid., 200.

<sup>21</sup> Ibid., 202.

<sup>22</sup> Ibid., 202.



<sup>23</sup> Ibid., 202.

<sup>24</sup> Ibid., 206.

<sup>25</sup> Peters, Ralph, Quotes on Urban Warfare, <<http://www.urbanoperations.com/>>, accessed 30 Oct 2003.

<sup>26</sup> Murray, Williamson and Major General Robert H. Scales, Jr., *The Iraq War – A Military History*, (The Belknap Press of Harvard University Press, 2003), paraphrase 101-104.

<sup>27</sup> Jones, Steven M., "Re-Examining Tomorrow's Battlefield: Taking the Fight Into the Cities," *Student Issue Paper, Center for Strategic Leadership*, U.S. Army War College, June 2003, Vol. S03-01, 1.

<sup>28</sup> Ibid., 2.

<sup>29</sup> Steven Alexander, "Urban Warfare: US Forces in Future Conflicts," *Military Review*, Jan-Feb 2002, 83.

<sup>30</sup> Crane, Dr. Conrad C., *Bombs, Cities and Civilians – American Airpower Strategy in World War II*, (University Press of Kansas, 1993), paraphrase 1-11, 154-157.

<sup>31</sup> Dauber, Cori, "Image as Argument: The Impact of Mogadishu on U.S. Military Intervention," *Armed Forces and Society*, Winter, 2001, Vol. 27, No.2, quoting Steven Kull and Clay Ramsey, "U.S. Public Attitudes on Involvement in Somalia," (College Park, MD: Program on International Policy Attitudes of the Center for the Study of Policy Attitudes and the School of Public Affairs, October, 26, 1993), 3.

<sup>32</sup> Kissinger, Henry, Quotes on Urban Warfare, <<http://www.urbanoperations.com/>>, accessed 2 Nov, 2003.

<sup>33</sup> Joint Publication 3-06, *Doctrine for Joint Urban Operations*, II-15.

<sup>34</sup> Ibid., II-15.

<sup>35</sup> Tzu, Sun, *The Art of War*, Translated by Samuel B. Griffith, (Oxford University Press, 1963), 78.

<sup>36</sup> Krulak, General C.C., Commandant of the USMC, Speech on Urban Warfare, 1999.

<sup>37</sup> Bin Laden, Osama, Quotes on Urban Warfare, <<http://www.urbanoperations.com/>>, accessed 3 Nov, 2003.

<sup>38</sup> Defense Planning Guidance, FY 2000 – 2005, Quotes on Urban Warfare, <<http://www.urbanoperations.com/>>, accessed 5 Nov, 2003.

<sup>39</sup> Schwartz, Maj Gen Norton A., Speech, "The Role of Aerospace Power in Joint Urban Operations," April, 1999 and "Don't Go Downtown Without Us, The Role of Aerospace Power in Joint Urban Operations," *Aerospace Power Journal*, Spring, 2000.

<sup>40</sup> Warden III, Col. John A., *The Air Campaign*, (National Defense University Press, Fort Lesley J. McNair, Washington, DC, 1988), 9.

<sup>41</sup> Carl von Clausewitz, *On War*, translated and edited by Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 595.

<sup>42</sup> Joint Publication 3-06, *Doctrine for Joint Urban Operations*, II-12.

<sup>43</sup> Glenn, Dr. Russel, Quotes on Urban Warfare, <<http://www.urbanoperations.com/>>, accessed 6 Nov, 2003.

<sup>44</sup> Hicks, Marcus, Major, USAF, *Fire in the City, Airpower in Smaller Scale Contingencies*, (School of Advanced Airpower Studies, Maxwell Air Force Base, Alabama, 1999) 47-49.

<sup>45</sup> Wheeler, Edward, Brig. Gen., (USA-Ret.) and Lt Col Craig Roberts, (USAR-Ret.), *Doorway to Hell, Disaster in Somalia*, (Consolidated Press International, Tulsa, OK, 2002), 194-198.

<sup>46</sup> Hicks, 92-100.

<sup>47</sup> Thomas, Timothy L, *The Battle of Grozny: Deadly Classroom for Urban Combat*, (Parameters, Summer, 1999) 97-102.

<sup>48</sup> Clark, Wesley K., *Waging Modern War: Bosnia, Kosovo and the Future of Combat*, (New York: Public Affairs Press, 2001) 1-87

<sup>49</sup> Wrage, Stephen D., *Immaculate Warfare: Participants Reflect on the Air Campaigns over Kosovo, Afghanistan, and Iraq*, (Greenwood Publishing Group, Inc., 2003) 58.

<sup>50</sup> Ibid. 57-58.

<sup>51</sup> Murray and Scales, 154-183.

<sup>52</sup> Pace, Peter, General, Quotes on Urban Warfare, <<http://www.urbanoperations.com/>>, accessed 8 Nov, 2003.

<sup>53</sup> Joint Publication 3-06, *Doctrine for Joint Urban Operations*, I-10.



## BIBLIOGRAPHY

- Alexander, Steven E. "Urban Warfare: U.S. Forces in Future Conflicts." *Military Review* (January-February 2002): 83-85.
- Amato, Edward J. *Street Smarts: Unconventional Warriors in Contemporary Joint Urban Operations*. Thesis (M.S.) Monterey: U.S. Naval Postgraduate School, June 2001. 88pp. (V425 .U5 TH A62) available from <<http://handle.dtic.mil/100.2/ADA393228>>. Internet. Accessed 17 Oct 2003.
- Barry, John L. and Ellis, Joseph, "An Aerospace View of Urban Operations," U.S. Naval Institute. *Proceedings* (July 2002) 98-99.
- Burger, Kim. "Fighting in the Streets." ("Future military conflicts are likely to occur in cities.") (20 November 2002): 22-27.
- Carl von Clausewitz, *On War*, translated and edited by Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976).
- Clark, Wesley K., *Waging Modern War: Bosnia, Kosovo and the Future of Combat*, (New York: Public Affairs Press, 2001).
- Cooling, Norman L. "Creating the Conditions Needed to Win the Street Fight." *Marine Corps Gazette* (January 2002): 54-68.
- Crane, Dr. Conrad C., *Bombs, Cities and Civilians—American Airpower Strategy in World War II*, University Press of Kansas, 1993.
- Dake, Terrance R, General, USMC, briefing slides, *The City's Many Faces: Investigating the Multifold Challenges of Urban Operations*, April, 1999.
- Dauber, Cori, "Image as Argument: The Impact of Mogadishu on U.S. Military Intervention," *Armed Forces and Society*, Winter, 2001, Vol. 27, No.2, quoting Steven Kull and Clay Ramsey, "U.S. Public Attitudes on Involvement in Somalia," (College Park, MD: Program on International Policy Attitudes of the Center for the Study of Policy Attitudes and the School of Public Affairs, October, 26, 1993).
- Defense Planning Guidance, FY 2000 – 2005, Quotes on Urban Warfare, available from <<http://www.urbanoperations.com/>>, accessed 5 Nov, 2003.
- Desch, Michael C., ed. *Soldiers in Cities: Military Operations on Urban Terrain*. Carlisle Barracks: U.S. Army War College, *Strategic Studies Institute*, October 2001. 169pp. (U413 .A66S635 2001) Also available from <<http://www.carlisle.army.mil/ssi/pubs/2001/cities/cities.htm>>. Internet. Accessed 17 Oct 2003.
- Edwards, Sean J.A. *Freeing: Mercury's Wings: Improving Tactical Communications in Cities*. Report MR-1316. Santa Monica: Rand, 2001. 61pp. (U167.5 .S7E29 2001)

- Edwards, Sean J.A. Mars Unmasked: The Changing Face of Urban Operations. *Report MR-1173-A. Santa Monica: Rand, 2000.* 108pp. (U167.5 .S7E39 2000) Also available from <<http://www.rand.org/publications/MR/MR1173/>>. Internet. Accessed 17 Oct 2003.
- Elhefnawy, Nader. "Defensive Armor Deployments in Urban Areas." *Armor* (January-February 2003): 14-17.
- Funkhouser, Anthony C., and Janet L. Kirkton. "Doctrinal Changes in Urban Operations." *Engineer* (January-March 2003): 10.
- Gangle, Randy. "Project Metropolis." *Marine Corps Gazette* (May 2002): 47-49
- Gerwehr, Scott, and Russell W. Glenn. The Art of Darkness: Deception and Urban Operations. *Report MR-1132-A. Santa Monica: Rand, 2000.* 70pp. (U167.5 .S&G26 2000) Also available from <<http://www.rand.org/publications/MR/MR1132/>>. Internet. Accessed 17 Oct 2003.
- Gerwehr, Scott, and Russell W. Glenn. Unweaving the Web: Deception and Adaptation in Future Urban Operations. *Report MR-1495-A. Santa Monica: Rand, 2002.* 78pp. (U167.5 .S7G47 2002) Also available from <<http://www.rand.org/publications/MR/MR1495/>>. Internet. Accessed 24 Oct 2003.
- Glenn, Russell W. "Urban Combat Is Complex." *Proceedings – U.S. Naval Institute* (February 2002): 62-65.
- Glenn, Russell W. Heavy Matter: Urban Operations' Density of Challenges. *Report MR-1239-JS/A. Santa Monica: Rand, 2000.* 48pp. (U167.5 S7G42 2000) Also available from <<http://www.rand.org/publications/MR/MR1239/>>. Internet. Accessed 24 Oct 2003.
- Glenn, Russell W., and others. Ready for Armageddon. Proceedings of the 2001 RAND Arroyo-Joint ACTD-CETO-USMC Non-lethal and Urban Operations Program Urban Operations Conference. *Report CF-179-A. Santa Monica: Rand, 2002.* 112pp. (U167.5 .S7R43 2002) Also available from <<http://www.rand.org/publications/CF/CF179/>>. Internet. Accessed 24 Oct 2003.
- Glenn, Russell W., ed. Capital Preservation: Preparing for Urban Operations in the Twenty-First Century. Proceedings of the RAND Arroyo-TRADOC-MCWL-OSD Urban Operations Conference, 22-23 March 2000. *Report CF-162-A. Santa Monica: Rand, 2001.* (U167.5 .S7C36 2001) Also available from <<http://www.rand.org/publications/CF/CF162/>>. Internet. Accessed 24 Oct 2003.
- Handbook for Joint Operations, United States Joint Chiefs of Staff Publication, 17 May 2000.
- Hicks, Marcus, Major, USAF, Fire in the City, Airpower in Smaller Scale Contingencies, (School of Advanced Airpower Studies, Maxwell Air Force Base, Alabama, 1999).
- Hills, Alice. "Deconstructing Cities: Military Operations in the Urban Era." *Journal of Conflict Studies* (Fall 2002): 99-117.
- Hunt, Peter C. Aerospace Power in Urban Warfare: Beware the Hornet's Nest. *INSS Occasional Paper 39.* Colorado Springs: USAF Academy, USAF Institute for National Security

- Studies, May 2001. 52pp. (UG638.5 .F7O3 no.39) Also available from <<http://www.usafa.af.mil/inss/ocp39.doc>>. Internet. Accessed 24 Oct 2003.
- Johnson, Scott C. Tactical Mobility of the Medium Weight Force in Urban Terrain. Fort Leavenworth, U.S. Army Command and General Staff College, 2001. 61pp. (U415 .A42 01 J53) Also available from <<http://www.urbanoperations.com/tacticalmobility.pdf>>. Internet. Accessed 31 Oct 2003.
- Joint Publication 3-06, Doctrine for Joint Urban Operations, 16 September, 2002.
- Jones, Steven M., "Re-Examining Tomorrow's Battlefield: Taking the Fight Into the Cities," Student Issue Paper, *Center for Strategic Leadership, U.S. Army War College*, June 2003, Vol. S03-01.
- Krulak, General C.C., Commandant of the USMC, Speech on Urban Warfare, 1999.
- Lawlor, Maryann. "Soldiers Train for Urban Terrain." *Signal* (February 2003): 51-53.
- Leonard, Robert, "Urban Warfare is the fight of the future- the very near future - and we are not ready" cited in "Urban Warfare in the Information Age," *Army*, Apr 2003.
- Leonhard, Robert R. "Urban Warfare in the Information Age." *Army* (April 2003): 38-44.
- Liotta, P.H., Chaos as Strategy, *Parameters*, Summer 2002.
- Lykke, Arthur F., Jr., *Military Strategy: Theory and Application*. Carlisle Barracks, Pa: U.S. Army War College, 1989.
- McCleskey, Edward G., Urban Warfare at the Operational Level: Identifying Centers of Gravity and Key Nodes (Maj, USAF - Air University 1999 – PDF) Accessed 16 Nov 2003.
- McGuiness, Matthew P. United States Army Special Forces: The 21st Century Urban Challenge. *Strategy Research Project. Carlisle Barracks: U.S. Army War College, May 2000*. 38pp. (AD-A380-140) Also available from <<http://www.urbanoperations.com/tacticalmobility.pdf>>. Internet. Accessed 31 Oct 2003.
- Medby, Jamison Jo, and Russell W. Glenn. Street Smart: Intelligence Preparation of the Battlefield for Urban Operations. *Report MR-1287-A. Santa Monica: Rand, 2002*. 151pp. (U167.5 .S7M43 2002) Also available from <<http://www.rand.org/publications/MR/MR1287/>>. Internet. Accessed 31 Oct 2003.
- Murray, Williamson and Major General Robert H. Scales, Jr., *The Iraq War – A Military History*, The Belknap Press of Harvard University Press, 2003.
- Peters, Ralph, "Our Soldiers, Their Cities," *Parameters*, Spring, 1996.
- Peters, Ralph, The Human Terrain of Urban Operations, *The Eurasian Politician*, Issue 3, October 2000, 8-16, and also from *Parameters*, Spring, 2000.
- Pike, James F., Urban Operations in Chechnya: Lessons Learned and Implications for U.S. Urban Doctrine and Training. *Strategy Research Project. Carlisle Barracks: U.S. Army*

- War College*, May 2002. 67pp. (AD-A391-880) Also available from <<http://handle.dtic.mil/100.2/ADA391880>>. Internet. Accessed 4 Nov 2003.
- Roos, John G. "Going 'Downtown': Urban-Combat Operations Will be Joint Affairs." *Armed Forces Journal* 140 (February 2003): 30-32.
- Schwartz, Maj Gen Norton A., briefing slides, "The Role of Aerospace Power in Joint Urban Operations," April, 1999 taken from the article "Don't Go Downtown Without Us, The Role of Aerospace Power in Joint Urban Operations," *Aerospace Power Journal*, Spring, 2000.
- Steven Alexander, "Urban Warfare: US Forces in Future Conflicts," *Military Review*, Jan-Feb 2002.
- Thomas, Timothy L, The Battle of Grozny: Deadly Classroom for Urban Combat, (*Parameters*, Summer, 1999)
- Thomas, Troy S. "Slumlords." (The author provides airmen with insights into urban warfare.) *Aerospace Power Journal* 16 (Spring 2002): 57-68.
- Tiron, Roxana. "Urban Exercise Tests Novel Technology." *National Defense* (November 2002): 62-64.
- Tzu, Sun, *The Art of War*, Translated by Samuel B. Griffith, (Oxford University Press, 1963).
- Urban Operations Journal. Web site. <<http://www.urbanoperations.com/>>. Internet. Accessed 4 Nov 2003.
- Valenti, Michael. "Boulevards of Steel: Technology May Take Some of the Uncertainties Out of Urban Warfare." *Journal of Electronic Defense* (September 2002): 57-60.
- Vick, Alan, and others. Aerospace Operations in Urban Environments: Exploring New Concepts. *Report MR-1187-AF*. Santa Monica: Rand, 2000. 285pp. (U167.5 .S7A37 2000) Also available from <<http://www.rand.org/publications/MR/MR1187/>>. Internet. Accessed 4 Nov 2003.
- Vick, Alan., Aerospace Operations Against Elusive Ground Targets. Prepared for the United States Air Force, *Project Air Force*, Santa Monica, Rand, 2001.
- Vick, Alan., Aerospace Operations in Urban Environments – Exploring New Concepts. Prepared for the United States Air Force, *Project Air Force*, Santa Monica, Rand, 2000.
- Warden III, Col. John A., *The Air Campaign*, (National Defense University Press, Fort Lesley J. McNair, Washington, DC, 1988).
- Wheeler, Edward, Brig. Gen., (USA-Ret.) and Lt Col Craig Roberts, (USAR-Ret.), *Doorway to Hell, Disaster in Somalia*, (Consolidated Press International, Tulsa, OK, 2002).
- Wilson, George, Quotes on Urban Warfare, available from <<http://www.urbanoperations.com/>>, Internet. Accessed 29 Oct 2003.
- Wrage, Stephen D., *Immaculate Warfare: Participants Reflect on the Air Campaigns over Kosovo, Afghanistan, and Iraq*, (Greenwood Publishing Group, Inc., 2003).